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Charge Ordering in Eu_4As_3

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Anomalous low temperature properties of Yb_4As_3 are successfully explained by one-dimensional antiferromagnetic chains ascribed to a charge ordering transition. However there is still an open question in the charge ordering itself, namely, an arrangement of di- and trivalent rare earth ions to minimize a Madelung energy is different from an actual one. To find another candidate that dominates the charge ordering, we prepared a single crystal of Eu_4As_3 in which only spin moments are dominant. The measurements of X-ray diffraction, specific heat, transport properties and susceptibility revealed that the charge ordering in Eu_4As_3 is same as that in Yb_4As_3, however, an appearance of ferromagnetism in Eu_4As_3 is a striking contrary to Yb_4As_3. These results indicate that the charge ordering is subject to neither orbital degree of freedom nor exchange interaction.